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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,038	03/27/2006	Kenji Hosaka	NNA-246-B	8023

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EXAMINER	
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ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/574,038	HOSAKA ET AL.	
	Examiner	Art Unit	
	Edu E. Enin-Okut	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) *2* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

BIPOLAR ELECTRODE BATTERIES AND METHODS OF MANUFACTURING BIPOLAR ELECTRODE BATTERIES

Detailed Action

1. The amendments filed on March 15, 2009 were received. Applicant has amended claims 1, 3, 4, 10 and 12; cancelled claim 2; and, added claim 21. Currently, claims 1 and 3-21 are pending.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

3. The rejection of claims 1, 3-6, 8 and 10-11 under 35 U.S.C. 102(b) as being anticipated by Munshi (US 6,664,006) is maintained.

Regarding claims 1 and 3-6, Munshi discloses stackable solid-state electrochemical cells, such as ultra-thin bipolar batteries with bipolar electrode structures having a polymer substrate serving as the film bipolar element (bipolar electrode stack) (9:36-40, 26:4-7, 29:1-7, 29:20-22). The bipolar structure is made by laminating anode and cathode active elements to opposing sides of a polymer substrate (collector) impregnated with conductive materials, such as a carbon black or metallic elements, dispersed throughout the polymer material of the substrate (26:7-18). Munshi also discloses that the impregnated substrate, highly desirable for bipolar designs, can be metallized; *however, metallization of the substrate is optional* (emphasis added) (22:49-50, 22:52-53). The polymer material forming the polymer substrate described above includes polyester (PET) (high-polymer material) and may also be impregnated with an electronically conductive element including electronically conducting polymers, such as polyacetylene, polypyrrole, polyaniline, etc. (21:66-22:8, 22:18-27,22:28-43, 22:49-50, 26:11-14). (One would appreciate that "PET" is the acronym for polyethylene terephtalate.)

Regarding claim 8, Munshi also discloses that opposite ends an electrochemical cell can have a layer of metal sprayed onto them to serve as battery terminations (electrode extracting plates) (25:46-49).

Regarding claims 10 and 11, Munshi discloses that the batteries can be stacked in rectangular prismatic modules [battery module] and may be used as a cost-effective power source for an electric vehicle (6:33-44, 29:30-34). The remaining limitations recited in claim 10 have been addressed above with respect to claim 1.

Claim Rejections - 35 USC § 103

4. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi as applied to claims 1, 3-6, 8 and 10-11 above.

Munshi is applied and incorporated herein for the reasons above.

Regarding claim 21, Munshi teaches that its bipolar electrode structure includes a polymer substrate (collector) impregnated with conductive materials, such as a carbon black or metallic elements, dispersed throughout the polymer material of the substrate, as discussed above. Munshi does not expressly teach that the plurality of conductive particles includes two or more types of electrically conductive particles. However, it is *prima facie* obvious to combine two compositions, each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the same purpose. *In re Kerkhoven*, 205 USPQ 1069, 1072. See MPEP 2144.06 (I).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi as applied to claims 1, 3-6, 8 and 10-11, and further in view of Hwang et al. (US 2005/0084760) is maintained.

Munshi is applied and incorporated herein for the reasons above.

Regarding claim 7, Munshi does not expressly teach that the high-polymer material exhibits a weight average molecular weight of from about 50,000 Daltons to about 1 million Daltons.

Hwang teaches a battery that includes a current collector having a polymer film with a metal deposited on the polymer film (Abstract; para. 12). The polymer film has a rigid characteristic which keeps it from stretching during the rolling step of the battery fabrication process while still having sufficient flexibility to be rolled during the fabrication process (para. 13). The polymer may be a polyethylene terephthalate, polyimide, polytetrafluoroethylene, polyethylene naphthalene, polyvinylidene fluoride, polyethylene naphthalate, polypropylene, polyethylene, polyester, or polysulfone (para. 13). The polymer has a molecular weight of 10,000 to 7,000,000, and preferably 50,000 to 5,000,000 (para. 13).

Since it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art (e.g., *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990)), it would have been obvious to one of ordinary skill in the art at the time of the invention to form the collector of Munshi using a polymer with a weight as recited by the claim because Hwang teaches that polymers with weight within that range produce a strong, but flexible, film. See MPEP 2144.05 (I).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi as applied to claims 1, 3-8 and 10-11 above, and further in view of Usui et al. (US 6,656,232) is maintained.

Munshi is applied and incorporated herein for the reasons above.

Regarding claim 9, Munshi teaches that opposite ends of its electrochemical cells have a layer of metal sprayed onto them to serve as battery terminations, as discussed above.

Munshi does not expressly teach that the sprayed metal forms a metal foil.

Usui teaches a method of manufacturing of a battery electrode (Title). The reference discuses that producing an electrode including a metal sprayed layer on one side of the electrode on which to weld the lead piece, a method of depositing metal foil in advance for reinforcement, etc., to improve the electric conductivity of a material core portion (1:41-48). It would have been obvious to one of ordinary

skill in the art at the time of the invention to form the electrode extracting plate of Munshi by depositing a metal foil because Usui teaches that it is a method with which to produce an electrical contact within a battery.

7. Claims 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munshi as applied to claims 1 and 3-11, and further in view of Hopkins et al. (US 2004/0001998) is maintained.

Munshi is applied and incorporated herein for the reasons above.

Regarding claims 12-15 and 18-20, Munshi teaches the composition of a bipolar battery as discussed above in paragraph 3. Munshi also teaches methods of making a thin bipolar battery composed of laminating tightly together at least one layer of bipolar unit between an anode and a cathode to provide a stack having laminar ends (16:3-48, 26:4-26; Claim 47). The opposite ends of the bipolar unit have a layer of metal sprayed onto them to serve as battery terminations (25:46-49). Batteries can be stacked in rectangular prismatic modules and may be used as a cost-effective power source for an electric vehicle (6:33-44, 29:30-34).

However, Munshi does not expressly teach the use of an inkjet printing method; or, that the method is a piezoelectric printing method; or, the curing the high polymer material.

Hopkins teaches the use of a drop on demand printing apparatus to form printed battery structures (para. 9). A drop on demand drop emitting printhead, used to emit fluid drops of electrode forming liquids onto a carrier medium, can be composed of a piezoelectric printhead similar to thermal or piezoelectric drop emitting printheads (para. 9-12). The apparatus can be used to emit drops of a polymer used to form an electrolyte region (para. 17). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a piezoelectric inkjet printing method to apply the collector and electrodes of the bipolar battery of Munshi because Hopkins teaches that inkjet printing methods can be used to form printed battery structures, including polymeric structures, and thereby simplify the battery

manufacturing process by the use one process for multiple components. Further, that artisan would have also found it obvious to the use inkjet printing methods because Hopkins also teaches that it produces small batteries with different configurations for use in portable devices that continue to reduce in size (see Hopkins, para. 2).

Regarding claims 16 and 17, neither Munshi nor Hopkins expressly teaches the curing the high polymer material; or, that the curing is carried out using thermal curing or radiation curing.

However, Munshi does teach use of radiation, electron beam, thermal and ultraviolet curing methods for the preparation of interpenetrating polymeric networks (IPN) containing various types of polyacrylates and liquid organic solvents (5:5-11; Claims 44, 47). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to cure the high polymer of the collector formed using the method of Munshi, as modified by Hopkins, because Munshi teaches that curing can create interpenetrating polymeric networks and, in turn, increase the strength of the resulting collector.

Double Patenting

8. The rejection of claims 1, 12, 18 and 19 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 11 and 19-20 of copending Application No. 11/936,159 is withdrawn because claims 1 and 12 were amended.

9. Claims 1 and 8-11 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 5, 16-17 and 19-21 of copending Application No. 11/946,177 in view of Munshi (US 6,664,006) is maintained. The rejection is repeated below for convenience.

Claims 1, 5, 16-17 and 19-21 of Application No. 11/946,177 teaches the components of the bipolar battery stack as recited in claims 1 and 8-11 of the instant application. However, Application No. 11/946,177 does not expressly teach that the collector comprises a high-polymer material.

Munshi teaches stackable solid-state electrochemical cells, such as ultra-thin bipolar batteries with bipolar electrode structures having a polymer substrate serving as the film bipolar element (bipolar electrode stack) (9:36-40, 26:4-7, 29:1-7, 29:20-22). The polymer material forming the polymer substrate includes polyester (PET) (high-polymer material) and may also be impregnated with an electronically conductive element including electronically conducting polymers, such as polyacetylene, polypyrrole, polyaniline, etc. (21:66-22:8, 22:18-27,22:28-43, 22:49-50, 26:11-14). (One would appreciate that "PET" is the acronym for polyethylene terephtalate.)

It would have been obvious to form the collector of Application No. 11/946,177 of the high-polymer of Munshi to form a highly flexible collector resistant to damage during manufacture of a battery (see Munshi, 22:63-23:4).

This is a provisional obviousness-type double patenting rejection.

Response to Arguments

10. Applicant's arguments filed March 15, 2009 have been fully considered but they are not persuasive.

11. Applicant makes the following arguments in its remarks:

(a) "Munshi does not teach a collector comprised of a high-polymer material, as low-polymer material is disclosed in Munshi." (p. 7);

(b) "Munshi also does not disclose an anode and a cathode in direct contact with at least a portion of the high-polymer material of the collector." (p. 7);

(c) "Munshi does not anticipate [amended] claim 4." (p. 7, 8);

> (d) "[t]o fulfill the long-felt need of thinner and lighter batteries, Applicants found a way to reduce the weight of the claimed battery by eliminating the need for a metal layer on the surface of the collector. ... It was unexpectedly discovered that the use of high polymer material, in particular polyethylene terephthalate, polyimide and polyamide, prevents the volatilization and migration of the electrolyte similar to a metal layer...The collector can be made very thin and does not require an outer metal layer, thereby reducing the weight and thickness of the battery. (¶[0025], Decl., ¶ 7) ... Munshi does not teach these capabilities because Munshi does not teach or suggest a collector comprising a high-polymer material with the anode and cathode in direct contact with at least a portion of the high-polymer material of the collector. ...". (p. 8);
>
> (e) "... Hwang et al. reduces the weight of conventional collectors, disclosing a collector including a polymer film with a metal deposited on the polymer film. (¶[0012]). ... Although Hwang et al. discloses the use of higher molecular weight polymers, Hwang et al. obviously does not realize the unexpected result of eliminating migration of electrolytes, as the polymer is covered with the coating of metal. (Decl.. ¶1 I)." (p. 9);
>
> (f) "There is no teaching in the combination of Munshi and Hwang et al. that would lead one skilled in the art to make a collector of any kind without the thinnest of metal layers on its surface, no matter what polymer is used. (Decl., ¶12)." (p. 9); and,
>
> (g) "Hopkins does not teach or suggest using an inkjet printing method to form a collector. Hopkins only discloses using an inkjet printer for forming electrodes on a collection. In addition, combining Hopkins with Munshi does not teach, suggest or render obvious the high polymer material with the anode and cathode material applied to opposite sides of the high polymer material collector deficient in Munshi. Therefore, claim 12 is not rendered obvious by the cited combination."

12. As to applicant's argument (a), (b), (c) and (f) above, Munshi does teach a collector formed of a polymer substrate made of a high-polymer material, i.e., a polyethylene terephthalate (PET), as discussed above in the rejection of claims 1 and 4 above. The collector of Munshi can be in direct contact with the anode and cathode in its bipolar electrode structure because one would appreciate that the metallization layers, such as layers 16a,16b included in the double-metallized electrode structure described by Munshi (see 25:34-46, Fig. 1C), are an *optional element* in its bipolar electrode structures described above in the rejection of claim 1 (see Munshi, 22:49-50, 22:52-53). Thus, one of ordinary skill in the art would appreciate that the bipolar electrode structure of Munshi, with a polymer substrate *without the metallization layers*, has an anode and cathode in direct contact with at least a portion of the surface of its collector, the polymer substrate.

13. As to applicant's argument (d) above, the courts have held that "[t]he discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's functioning, does not render the old composition patentably new to the discoverer." *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347, 51 USPQ2d 1943, 1947 (Fed. Cir. 1999). Thus, the claiming of a new use, new function or unknown property which is inherently present in the prior art, such as the battery of Munshi in view of Hwang et al., does not necessarily make the claim patentable. *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). See MPEP 2112 (I). Further, as to applicant's contentions with respect to the Munshi reference (and discussions made in the Declaration filed on March 15, 2009), applicant is directed to Paragraph 11 above.

14. As to applicant's argument (e) above, it is noted that the features upon which applicant relies are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Further, as discussed above, the courts have held that "[t]he discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's functioning, does not render the old composition patentably new to the discoverer." *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347, 51 USPQ2d 1943, 1947 (Fed. Cir. 1999). See MPEP 2112 (I).

15. As to applicant's argument (g) above, it is noted that it should be noted that "[t]he use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain." *In re Heck*, 699 F.2d 1331, 1332-33, 216 USPQ 1038, 1039 (Fed. Cir. 1983). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including non-preferred embodiments. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 10 USPQ2d 1843 (Fed.

Cir.), cert. denied, 493 U.S. 975 (1989); *Upsher-Smith Labs. v. Pamlab*, LLC, 412 F.3d 1319, 1323, 75 USPQ2d 1213, 1215 (Fed. Cir. 2005). See MPEP 2123 (I).

As discussed in the rejection of claim 12 above, Hopkins does teach that its drop on demand drop emitting printhead, such as a piezoelectric printhead, can be used to emit drops of a polymer forming a battery structure, i.e., an electrolyte (para. 17). One of ordinary skill in the art would appreciate that the inkjet method described by Hopkins can be used to form battery structures formed of a polymer, such as an electrolyte or a polymeric collector.

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact / Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday - Thursday, 7 a.m. - 3 p.m. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E Enin-Okut/
Examiner, Art Unit 1795

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795